

WHAT IS CLAIMED IS:

1. A method for use in determining the position of a user terminal, comprising:
receiving at the user terminal a digital television (DTV) broadcast signal transmitted
5 by a DTV transmitter;

tracking a periodic component of the DTV signal using a delay-lock loop (DLL),
including

selecting an observation interval based on the timing of the periodic
component, and

10 turning on a portion of the DLL during the observation interval, and turning
the portion off otherwise; and

determining a pseudo-range between the user terminal and the DTV transmitter based
on the DTV broadcast signal; and wherein

the position of the user terminal is determined based on the pseudo-range and a
15 location of the DTV transmitter.

2. The method of claim 1, further comprising:

determining the position of the user terminal based on the pseudo-range and the
location of the DTV transmitter.

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3. The method of claim 2, wherein determining a position of the user terminal
comprises:

adjusting the pseudo-range based on a difference between a transmitter clock at the
DTV transmitter and a known time reference; and

25 determining the position of the user terminal based on the adjusted pseudo-range and
the location of the DTV transmitter.

4. The method of claim 1, wherein the DTV broadcast signal is an American
Television Standards Committee (ATSC) DTV signal, and the pseudo-range is determined
30 based on a known digital sequence in the ATSC frame.

5. The method of claim 4, wherein the known digital sequence is a synchronization code.

5 6. The method of claim 5, wherein the synchronization code is a Field Synchronization Segment within an ATSC data frame.

7. The method of claim 5, wherein the synchronization code is a Synchronization Segment within a Data Segment within an ATSC data frame.

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8. The method of claim 1, wherein determining a position of the user terminal comprises:

determining an offset between a local time reference in the user terminal and a master time reference; and

15 determining the position of the user terminal based on the pseudo-range, the location of the DTV transmitter, and the offset.

9. The method of claim 1, wherein determining a pseudo-range comprises:
correlating the DTV signal with a signal generated by the user terminal as the DTV
20 signal is received to produce the pseudo-range.

10. The method of claim 1, further comprising:
tracking the pilot signal of the DTV signal using a phase-lock loop; and wherein
tracking the component of the DTV signal is based on the tracking of the pilot signal.

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11. The method of claim 1, further comprising:
transmitting the pseudo-range to a location server configured to determine a position
of the user terminal based on the pseudo-range and a location of the DTV transmitter.

30 12. The method of claim 1, wherein the position of the user terminal is determined by adjusting the pseudorange based on a difference between a transmitter clock at the

transmitter of the broadcast analog television signal and a known time reference, and determining the position of the user terminal based on the adjusted pseudorange and the location of the TV transmitter.

5 13. The method of claim 1, further comprising:
determining a further pseudorange based on a further DTV signal; and
projecting the pseudorange and the further pseudorange to an instant of time, thereby eliminating any first order term in the clock of the user terminal.

10 14. Computer-readable media embodying instructions executable by a computer to perform a method for use in determining the position of a user terminal, the method comprising:

receiving at the user terminal a digital television (DTV) broadcast signal transmitted by a DTV transmitter;

15 tracking a periodic component of the DTV signal using a delay-lock loop (DLL), including

selecting an observation interval based on the timing of the periodic component, and

turning on a portion of the DLL during the observation interval, and turning
20 the portion off otherwise; and

determining a pseudo-range between the user terminal and the DTV transmitter based on the DTV broadcast signal; and wherein

the position of the user terminal is determined based on the pseudo-range and a location of the DTV transmitter.

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15. The media of claim 14, wherein the method further comprises:
determining the position of the user terminal based on the pseudo-range and the location of the DTV transmitter.

30 16. The media of claim 15, wherein determining a position of the user terminal comprises:

adjusting the pseudo-range based on a difference between a transmitter clock at the DTV transmitter and a known time reference; and

determining the position of the user terminal based on the adjusted pseudo-range and the location of the DTV transmitter.

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17. The media of claim 14, wherein the DTV broadcast signal is an American Television Standards Committee (ATSC) DTV signal, and the pseudo-range is determined based on a known digital sequence in the ATSC frame.

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18. The media of claim 17, wherein the known digital sequence is a synchronization code.

19. The media of claim 18, wherein the synchronization code is a Field Synchronization Segment within an ATSC data frame.

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20. The media of claim 18, wherein the synchronization code is a Synchronization Segment within a Data Segment within an ATSC data frame.

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21. The media of claim 14, wherein determining a position of the user terminal comprises:

determining an offset between a local time reference in the user terminal and a master time reference; and

determining the position of the user terminal based on the pseudo-range, the location of the DTV transmitter, and the offset.

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22. The media of claim 14, wherein determining a pseudo-range comprises: correlating the DTV signal with a signal generated by the user terminal as the DTV signal is received to produce the pseudo-range.

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23. The media of claim 14, wherein the method further comprises: tracking the pilot signal of the DTV signal using a phase-lock loop; and wherein

tracking the component of the DTV signal is based on the tracking of the pilot signal.

24. The media of claim 14, wherein the method further comprises:
transmitting the pseudo-range to a location server configured to determine a position
5 of the user terminal based on the pseudo-range and a location of the DTV transmitter.

25. The media of claim 14, wherein the position of the user terminal is determined
by adjusting the pseudorange based on a difference between a transmitter clock at the
transmitter of the broadcast analog television signal and a known time reference, and
10 determining the position of the user terminal based on the adjusted pseudorange and the
location of the TV transmitter.

26. The media of claim 14, wherein the method further comprises:
determining a further pseudorange based on a further DTV signal; and
15 projecting the pseudorange and the further pseudorange to an instant of time, thereby
eliminating any first order term in the clock of the user terminal.

27. An apparatus for use in determining the position of a user terminal,
comprising:
20 means for receiving at the user terminal a digital television (DTV) broadcast signal
transmitted by a DTV transmitter;
means for tracking a periodic component of the DTV signal using a delay-lock loop
(DLL), including
means for selecting an observation interval based on the timing of the periodic
25 component, and
means for turning on a portion of the DLL during the observation interval, and
turning the portion off otherwise; and
means for determining a pseudo-range between the user terminal and the DTV
transmitter based on the DTV broadcast signal; and wherein
30 the position of the user terminal is determined based on the pseudo-range and a
location of the DTV transmitter.

28. The apparatus of claim 27, further comprising:
means for determining the position of the user terminal based on the pseudo-range
and the location of the DTV transmitter.

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29. The apparatus of claim 28, wherein means for determining a position of the
user terminal comprises:

means for adjusting the pseudo-range based on a difference between a transmitter
clock at the DTV transmitter and a known time reference; and

10 means for determining the position of the user terminal based on the adjusted pseudo-
range and the location of the DTV transmitter.

30. The apparatus of claim 27, wherein the DTV broadcast signal is an American
Television Standards Committee (ATSC) DTV signal, and the pseudo-range is determined
15 based on a known digital sequence in the ATSC frame.

31. The apparatus of claim 30, wherein the known digital sequence is a
synchronization code.

20 32. The apparatus of claim 31, wherein the synchronization code is a Field
Synchronization Segment within an ATSC data frame.

33. The apparatus of claim 31, wherein the synchronization code is a
Synchronization Segment within a Data Segment within an ATSC data frame.

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34. The apparatus of claim 27, wherein means for determining a position of the
user terminal comprises:

means for determining an offset between a local time reference in the user terminal
and a master time reference; and

30 means for determining the position of the user terminal based on the pseudo-range,
the location of the DTV transmitter, and the offset.

35. The apparatus of claim 27, wherein means for determining a pseudo-range comprises:

means for correlating the DTV signal with a signal generated by the user terminal as
5 the DTV signal is received to produce the pseudo-range.

36. The apparatus of claim 27, further comprising:

means for tracking the pilot signal of the DTV signal using a phase-lock loop; and
wherein

10 means for tracking the component of the DTV signal is based on the tracking of the
pilot signal.

37. The apparatus of claim 27, further comprising:

means for transmitting the pseudo-range to a location server configured to determine
15 a position of the user terminal based on the pseudo-range and a location of the DTV
transmitter.

38. The apparatus of claim 27, wherein the position of the user terminal is
determined by adjusting the pseudorange based on a difference between a transmitter clock at
20 the transmitter of the broadcast analog television signal and a known time reference, and
determining the position of the user terminal based on the adjusted pseudorange and the
location of the TV transmitter.

39. The apparatus of claim 27, further comprising:

25 means for determining a further pseudorange based on a further DTV signal; and
means for projecting the pseudorange and the further pseudorange to an instant of
time, thereby eliminating any first order term in the clock of the user terminal.

40. An apparatus for use in determining the position of a user terminal,
30 comprising:

an antenna to receive at the user terminal a digital television (DTV) broadcast signal transmitted by a DTV transmitter;

a receiver to track a periodic component of the DTV signal using a delay-lock loop (DLL), including a controller to

5 select an observation interval based on the timing of the periodic component, and

 turn on a portion of the DLL during the observation interval, and turning the portion off otherwise; and

 a processor to determine a pseudo-range between the user terminal and the DTV
10 transmitter based on the DTV broadcast signal; and wherein

 the position of the user terminal is determined based on the pseudo-range and a location of the DTV transmitter.

41. The apparatus of claim 40, wherein the processor determines the position of
15 the user terminal based on the pseudo-range and the location of the DTV transmitter.

42. The apparatus of claim 41, wherein the processor:
 adjusts the pseudo-range based on a difference between a transmitter clock at the
DTV transmitter and a known time reference; and
20 determines the position of the user terminal based on the adjusted pseudo-range and
the location of the DTV transmitter.

43. The apparatus of claim 40, wherein the DTV broadcast signal is an American
Television Standards Committee (ATSC) DTV signal, and the pseudo-range is determined
25 based on a known digital sequence in the ATSC frame.

44. The apparatus of claim 43, wherein the known digital sequence is a
synchronization code.

30 45. The apparatus of claim 44, wherein the synchronization code is a Field
Synchronization Segment within an ATSC data frame.

46. The apparatus of claim 44, wherein the synchronization code is a Synchronization Segment within a Data Segment within an ATSC data frame.

5 47. The apparatus of claim 40, wherein the processor:
determines an offset between a local time reference in the user terminal and a master time reference; and
determines the position of the user terminal based on the pseudo-range, the location of the DTV transmitter, and the offset.

10 48. The apparatus of claim 40, wherein the processor correlates the DTV signal with a signal generated by the user terminal as the DTV signal is received to produce the pseudo-range.

15 49. The apparatus of claim 40, further comprising:
a phase-lock loop to track the pilot signal of the DTV signal; and wherein tracking the component of the DTV signal is based on the tracking of the pilot signal.

20 50. The apparatus of claim 40, further comprising:
a transmitter to transmit the pseudo-range to a location server configured to determine a position of the user terminal based on the pseudo-range and a location of the DTV transmitter.

25 51. The apparatus of claim 40, wherein the position of the user terminal is determined by adjusting the pseudorange based on a difference between a transmitter clock at the transmitter of the broadcast analog television signal and a known time reference, and determining the position of the user terminal based on the adjusted pseudorange and the location of the TV transmitter.

30 52. The apparatus of claim 40, wherein the processor:
determines a further pseudorange based on a further DTV signal; and

projects the pseudorange and the further pseudorange to an instant of time, thereby eliminating any first order term in the clock of the user terminal.